

## CLAIMS

- 1    1.     A magnetic head having a magnetoresistive sensor, comprising:  
2           a plurality of sensor layers;  
3           a hard bias/lead structure being disposed at side areas of said sensor layers, said  
4    hard bias/lead structure including:  
5           a hard bias layer having a crystalline structure and electrical lead layer having an ordered  
6    crystalline structure, and wherein said crystalline structure of said lead is epitaxially  
7    matched to said crystalline structure of said hard bias layer.
  
- 1    2.     A magnetic head as described in claim 1, wherein said hard bias layer is  
2    composed of a cobalt alloy, and wherein said lead layer is formed with a B2 structure.
  
- 1    3.     A magnetic head as described in claim 2 wherein said lead layer is composed of  
2    NiAl.
  
- 1    4.     A magnetic head as described in claim 2 wherein said lead layer is comprised of  
2    NiAl, wherein the Ni composition ranges from approximately 45% to approximately  
3    60%.
  
- 1    5.     A magnetic head as described in claim 4 wherein said Ni composition is  
2    approximately 50%.

1 6. A magnetic head having a magnetoresistive sensor, comprising:  
2 a plurality of sensor layers;  
3 a hard bias/lead structure being disposed at side areas of said sensor layers, said  
4 hard bias/lead structure including an electrical lead layer having an ordered crystalline  
5 structure.

1 7. A magnetic head as described in claim 6 wherein said electrical lead layer ordered  
2 crystalline structure is selected from the group consisting of B2, L1<sub>0</sub>, L1<sub>1</sub>, L1<sub>2</sub> and D0<sub>3</sub>.

1 8. A magnetic head as described in claim 6 wherein said electrical lead layer is  
2 comprised of a material selected from the group consisting of NiAl, CuAu, Cu<sub>3</sub>Au, Ni<sub>3</sub>Al  
3 and Fe<sub>3</sub>Al.

1 9. A magnetic head having a magnetoresistive sensor, comprising:  
2 a plurality of sensor layers;  
3 a hard bias/lead structure being disposed at side areas of said sensor layers, said  
4 hard bias/lead structure including a hard bias layer that is comprised of a cobalt alloy, and  
5 an electrical lead layer that is comprised of an NiAl alloy and is deposited directly upon  
6 said hard bias layer.

1 10. A magnetic head as described in claim 9 wherein said NiAl electrical lead has a  
2 B2 crystalline structure.

1 11. A magnetic head as described in claim 9 wherein said NiAl lead layer includes Ni  
2 having a composition between 45% Ni and 60% Ni.

1 12. A magnetic head as described in claim 11 wherein said Ni composition is  
2 approximately 50%.

1 13. A hard disk drive including a magnetic head having a magnetoresistive sensor,  
2 comprising:

3 a plurality of sensor layers;

4 a hard bias/lead structure being disposed at side areas of said sensor layers, said  
5 hard bias/lead structure including:

6 a hard bias layer having a crystalline structure and electrical lead layer having an ordered  
7 crystalline structure, and wherein said crystalline structure of said lead is epitaxially  
8 matched to said crystalline structure of said hard bias layer.

1 14. A hard disk drive as described in claim 13, wherein said hard bias layer is  
2 composed of a cobalt alloy, and wherein said lead layer is formed with a B2 structure.

1 15. A hard disk drive as described in claim 14 wherein said lead layer is composed of  
2 NiAl.

1 16. A hard disk drive as described in claim 14 wherein said lead layer is comprised of  
2 NiAl, wherein the Ni composition ranges from approximately 45% to approximately  
3 60%.

1 17. A hard disk drive as described in claim 16 wherein said Ni composition is  
2 approximately 50%.

1 18. A hard disk drive including a magnetic head having a magnetoresistive sensor,  
2 comprising:

3 a plurality of sensor layers;

4 a hard bias/lead structure being disposed at side areas of said sensor layers, said  
5 hard bias/lead structure including an electrical lead layer having an ordered crystalline  
6 structure.

1 19. A hard disk drive including a magnetic head as described in claim 18 wherein said  
2 ordered crystalline structure is selected from the group consisting of B2, L1<sub>0</sub>, L1<sub>1</sub>, L1<sub>2</sub> and  
3 D0<sub>3</sub>.

1 20. A hard disk drive including a magnetic head as described in claim 18 wherein said  
2 electrical lead is comprised of a material selected from the group consisting of NiAl,  
3 CuAu, Cu<sub>3</sub>Au, Ni<sub>3</sub>Al and Fe<sub>3</sub>Al.

1 21. A hard disk drive including a magnetic head having a magnetoresistive sensor,  
2 comprising:

3 a plurality of sensor layers;

4 a hard bias/lead structure being disposed at side areas of said sensor layers, said  
5 hard bias/lead structure including a hard bias layer that is comprised of a cobalt alloy, and  
6 an electrical lead layer that is comprised of an NiAl alloy and is deposited directly upon  
7 said hard bias layer.

1 22. A hard disk drive as described in claim 21 wherein said NiAl electrical lead has a  
2 B2 crystalline structure.

1 23. A hard disk drive as described in claim 21 wherein said NiAl lead layer includes  
2 Ni having a composition between 45% Ni and 60% Ni.

1 24. A hard disk drive as described in claim 23 wherein said Ni composition is  
2 approximately 50%.

1 25. A method for fabricating a magnetic head, comprising:

2 fabricating a plurality of sensor layers upon a substrate, said sensor layers being  
3 formed with end portions thereof;

4 fabricating a hard bias/lead structure proximate said end portions of said sensor  
5 layers, including:

6 fabricating a hard bias layer;

7 fabricating an electrical lead layer directly upon said hard bias layer, where said

8 electrical lead layer is epitaxially matched to said hard bias layer.

1 26. A method for fabricating a magnetic head as described in claim 25, wherein said

2 electrical lead layer is fabricated by ion beam deposition.

1 27. A method for fabricating a magnetic head as described in claim 25, wherein said

2 hard bias layer is composed of a cobalt alloy, and wherein said electrical lead layer is

3 formed with a B2 structure.

1 28. A method for fabricating a magnetic head as described in claim 25 wherein said

2 electrical lead layer is composed of NiAl.

1 29. A method for fabricating a magnetic head as described in claim 28, wherein said

2 electrical lead layer is fabricated by ion beam deposition utilizing a target having an

3  $\text{Ni}_x\text{Al}_{1-x}$  composition where x is between 0.46 and 0.50.

1 30. A method for fabricating a magnetic head, comprising:

2 fabricating a plurality of sensor layers upon a substrate, said sensor layer being

3 formed with end portions thereof;

4            fabricating a hard bias/lead structure proximate end portions of said sensor layers,  
5 including:  
6            fabricating a hard bias layer;  
7            fabricating an electrical lead layer above said hard bias layer, where said lead  
8 layer is fabricated to have an ordered crystalline structure.

1    31.    A method for fabricating a magnetic head as described in claim 30 wherein said  
2 electrical lead layer ordered crystalline structure is selected from the group consisting of  
3 B2, L1<sub>0</sub>, L1<sub>1</sub>, L1<sub>2</sub> and D0<sub>3</sub>.

1    32.    A method for fabricating a magnetic head as described in claim 30 wherein said  
2 electrical lead layer is comprised of a material selected from the group consisting of  
3 NiAl, CuAu, Cu<sub>3</sub>Au, Ni<sub>3</sub>Al and Fe<sub>3</sub>Al.

33.    A method for fabricating a magnetic head as described in claim 32, wherein said  
electrical lead layer is fabricated by ion beam deposition.